

C15. CHAPTER 15  
UNEXPLODED ORDNANCE (UXO)

C15.1. SCOPE

This chapter establishes standards to protect personnel and property from explosive and CA hazards (see Chapter 11) associated with UXO or other military munitions, to include DMM, that have experienced abnormal environments. This chapter's standards do not apply during contingencies, combat operations, and military operations other than war; however, these explosives safety principles should always be considered in such circumstances and applied as the situation allows.

C15.2. GENERAL

C15.2.1. UXO are considered the most dangerous category of military munitions. However, other military munitions, to include DMM, that are encountered outside the Department of Defense's munitions logistics management system, particularly those that have experienced an abnormal environment, should be considered equally dangerous and managed as UXO until assessed and determined otherwise by technically-qualified personnel (i.e., EOD personnel, EOD-qualified U.S. Army Forces Command/20th Support Command/22nd Chemical Battalion personnel and, when specifically authorized by a DoD Component, UXO-qualified personnel). Military munitions that have experienced abnormal environments include, but are not limited to, munitions remaining after attempted demilitarization by OB or OD; munitions involved in accidents or fires; munitions or components subjected to certain tests (e.g., fuze arming tests, jolt and jumble tests) that might cause arming. (U.S. Army Forces Command/20th Support Command/ 22nd Chemical Battalion is manned with specially trained personnel that provide verification, sampling, detection, mitigation, render safe, decontamination, packaging, escort, and remediation of chemical, biological and industrial devices or hazardous materials.)

C15.2.1.1. UXO will most likely be found in areas that the Department of Defense currently uses (e.g., operational ranges) or once used (e.g., former ranges) for military munitions training or testing. For a variety of reasons, UXO can also be encountered in other areas, to include where contingency, combat, or military operations other than war have occurred.

C15.2.1.2. Munitions that may have experienced an abnormal environment might be encountered in areas at which an accident or incident involving military munitions occurred, in areas that the Department of Defense uses or once used for open detonation of excess, obsolete, or unserviceable military munitions, or in other areas.

C15.2.2. Positive identification of any potential explosive or CA hazards and consideration of the potential consequences of an intentional or accidental detonation is required before disposition of any recovered munition. This is essential for munitions that might contain CA that would pose a potential downwind CA hazard. Therefore, for both explosives and CA safety reasons, munitions found outside the Department of Defense's established logistical munitions

management systems (e.g., UXO, DMM) shall be managed as UXO, until assessed, identified, and evaluated as to their explosive or CA hazards and determined otherwise by technically qualified personnel. Munitions that contain an unknown liquid fill shall also be managed as CWM until assessed, and the fill determined.

C15.2.2.1. Only EOD personnel and, in some cases, U.S. Army Forces Command/20th Support Command/22nd Chemical Battalion personnel will respond to military or civilian authority requests for support to an explosives or munitions emergency.

C15.2.2.2. For responses that either involve RCWM or munitions that contain an unknown liquid fill, U.S. Army Forces Command/20th Support Command/22nd Chemical Battalion personnel and, in cases where the munition's physical characteristics allow positive identification, EOD personnel, are the only DoD personnel authorized to determine the most probable fill of such munitions. The determination as to whether certain munitions contain a CA fill is difficult, if not impossible, solely by visual inspection.

C15.2.2.2.1. Many munitions have physical characteristics (e.g., shape, markings) that permit technically qualified personnel to rule out the potential for a CA fill. For example, a U.S.-manufactured 4-inch Stokes mortar's physical dimensions clearly indicate whether it contains a CA or explosive fill. However, the design or physical condition of some munitions may not allow their complete identification by visual inspection. This is especially true for used munitions and for munitions that have either experienced abnormal environments or been exposed to the elements (e.g., buried or submerged) for an extended period.

C15.2.2.2.2. Munitions whose external design does not always allow positive visual identification of their filler include, but may not be limited to: 4.2-inch mortars (M1, M2, and the M2A1 models) and Livens projectiles (MKII (M1) and MKIIAI) models. U.S. Army Forces Command/20th Support Command/22nd Chemical Battalion personnel and, in some cases, EOD personnel, are the only DoD personnel authorized to determine the most probable fill of these munitions.

C15.2.3. Discovery of military munitions (e.g., UXO) outside the Department of Defense's munitions logistics management system might, in some circumstances, indicate that a munitions response (see Chapter 12) or other protective measures are warranted. DoD Components shall notify the Chairman, DDESB, and their respective Service-level explosives safety office of:

C15.2.3.1. Repetitive explosives or munitions emergency responses to a discrete geographic area, where the circumstances surrounding the explosives or munitions emergency response are similar.

C15.2.3.2. A single explosives or munitions emergency response that involves multiple military munitions (e.g., UXO, DMM, or RCWM) discovered at a discrete geographic area. Such discoveries might indicate that the area is a FUDS.

C15.2.4. To meet the notification requirements of paragraph C15.2.3, DoD Components and the Executive Manager for EOD Technology and Training are encouraged to jointly work toward

development of an explosives or munitions emergency response incident reporting system that will ensure all incidents are similarly reported and retained in a single DoD database, which can be queried, and will automatically identify the conditions of paragraph C15.2.3.

### C15.3. DISPOSITION OF UXO AND OF OTHER MILITARY MUNITIONS BEING MANAGED AS UXO

C15.3.1. The Department of Defense is responsible for protecting people, property, and the environment from potential explosive hazards (e.g., blast and fragmentation) or CA hazards (e.g., downwind hazards) associated with DoD-owned UXO. The Department of Defense is equally responsible for protecting personnel who respond to address such hazards.

C15.3.2. DoD Components shall work collaboratively with environmental regulators and safety officials toward resolving, in a mutually agreeable manner, any concerns with the planned disposition of UXO during a response action; however, the protection of people, to include DoD response personnel, from the hazards associated with the discovered munition and with its disposition is paramount.

C15.3.3. There are no safe procedures for moving, rendering safe, or destroying UXO, but merely procedures considered less dangerous. Destruction-in-place (also referred to as blow-in-place (BIP)) is the least dangerous; therefore, it is the preferred method of UXO destruction.

C15.3.4. DoD response actions to address UXO must comply with these Standards and other applicable DoD policies and with applicable federal, state, interstate, and local laws and regulations, and any enforceable agreements. DoD Components must ensure that, if not already in place, protective measures (e.g., site security) are implemented as quickly as practicable following discovery of UXO or other munitions outside the Department of Defense's munitions logistics management system. Should environmental regulators and safety officials have concerns regarding the sufficiency of the protective measures to be taken, these concerns should be raised to the appropriate-level DoD authority for resolution. Protective measures must be maintained throughout any delay caused by:

C15.3.4.1. Compliance with laws, regulations, and agreements.

C15.3.4.2. The need to address concerns raised by environmental regulators and safety officials about:

C15.3.4.2.1. Methods for managing any potential adverse impacts (e.g., harming endangered species, damaging cultural resources) of implementing a pending BIP operation.

C15.3.4.2.2. The use of alternative (to BIP) disposition methods.

C15.3.4.3. Other factors (e.g., weather).

C15.3.5. Military munitions known to contain CA or that contain or are suspected to contain an unknown liquid fill will not normally be destroyed by open detonation because they pose potential downwind CA hazards. The responsible DoD Component (normally the Department of the Army), no lower than the Deputy Assistant Secretary level, may approve individual exceptions. Such exceptions should only be approved after discussions (see paragraph C15.3.2.) with appropriate elected representatives, environmental regulators, and safety officials from those communities that could potentially be impacted by the munition's disposition. DoD Components must make sure that protective measures to ensure explosives safety are maintained during any delay in disposition.

C15.3.6. UXO shall not be moved unless technically qualified personnel determine that the risks associated with movement are acceptable. (During munitions responses, specifically authorized UXO-qualified personnel may make this determination.) Although environmental regulators and safety officials recognize the expertise of DoD personnel involved in UXO disposition decisions, they may challenge a DoD field expert's decision and seek to elevate their concerns to higher levels of authority for resolution. (See paragraphs C15.3.2. and C15.3.4.)

C15.3.6.1. If technically qualified personnel determine that the risk associated with movement is unacceptable, or if the munition's condition precludes a complete assessment beyond positive identification of any potential explosive hazard or determination that it does not present a CA hazard, then it should be BIP.

C15.3.6.2. In some circumstances, EOD personnel may determine that careful movement of a UXO, for a limited distance and using prescribed EOD procedures, is both necessary and allowed by EOD procedures. In such circumstances, destruction by detonation will occur in the general vicinity of discovery.

C15.3.7. Under some circumstances, when BIP does not pose an immediate, certain, and unacceptable risk to people, critical operations, facilities, or equipment, environmental regulators and safety officials may seek collaboration (see paragraph C15.3.2.) with DoD Components to mutually agree to mitigation measures to reduce potential impacts of the pending BIP to public safety, the environment, and cultural resources. (See paragraph C15.3.4.)

C15.3.8. When BIP poses an immediate, certain, and unacceptable risk to people, critical operations, facilities, or equipment, EOD personnel may determine that render safe procedures (RSP) should be attempted.

C15.3.8.1. Because the application of RSP exposes EOD personnel to added risks (greater than BIP), the application of RSP shall only be attempted in limited circumstances.

C15.3.8.2. Should EOD personnel employ RSP, protective measures shall be applied to mitigate potential explosive effects and, when necessary, a possible CA release.

C15.3.8.3. Only EOD personnel are authorized to conduct RSP.

C15.3.8.4. EOD personnel shall perform RSP per Joint Service EOD Technical Data.

C15.3.8.4.1. Conflicts between this Standard and the Joint Service EOD Technical Data should be raised to the Chairman, DDESB, and to the Joint EOD Program Board for resolution.

C15.3.8.4.2. When the condition of UXO (e.g., crushed, bent, broken, mangled) precludes strict adherence to published procedures, onsite EOD personnel will determine and perform the procedure -- established or innovative -- that will have the most probable degree of success to render the munitions safe while mitigating potential explosive or, when necessary, CA effects.

C15.3.9. The onsite EOD supervisor or, in the case of munitions responses, the UXO safety officer, shall ensure that the detonation site is inspected after each detonation or any misfire. No one shall be allowed within MSD from the detonation site until the onsite EOD supervisor or UXO safety officer declares the area is safe.

C15.3.10. When EOD personnel or, in the case of munitions responses, authorized UXO-personnel, positively identify UXO as to its explosive hazard and determine it safe to dispose of by other than BIP or immediate destruction by detonation, either in the general vicinity of discovery or at a designated location, then technically qualified personnel or an appropriate-level DoD authority with the advice of technically qualified personnel, may evaluate a variety of safe disposition alternatives and options for managing any potentially adverse impact of the selected disposition alternative. (See paragraph C15.3.2.)

#### C15.4. SPECIAL CONSIDERATIONS

##### C15.4.1. Disassembly and Inerting Operations

C15.4.1.1. Disassembly and inerting operations shall not be conducted without proper authorization.

C15.4.1.2. DoD Components must establish procedures for authorizing such operations.

##### C15.4.2. Construction Support

C15.4.2.1. Construction support may be required during intrusive activities (e.g., laying or repairing utilities, improving roads) on property known or suspected to contain UXO or DMM.

C15.4.2.2. The responsible authority (e.g., installation commander or designated representative) shall determine the level of construction support required on a case-by-case basis. Construction support is determined by the probability of encountering UXO or DMM.

C15.4.2.2.1. Low Probability. EOD personnel or UXO-qualified personnel must be contacted to ensure their availability, advised about the project, and placed “on call” to assist if

suspected UXO are encountered during construction. (Discoveries of UXO or DMM on such sites requires reassessment of the level of support required.)

C15.4.2.2.1.1. A “low” determination may only be assigned to those areas for which a search of available historical records and onsite investigation data indicates that, given the military or munitions-related activities that occurred at the site, the likelihood that UXO or other MEC are present is low.

C15.4.2.2.1.2. Munitions-related activities that may merit a “low” determination include, but are not limited to, the use of the area: for live-fire training exclusively with small arms ammunition; for maneuver training, to include maneuver training involving the use of smokes, pyrotechnics, and simulators; as firing points; for munitions inspection, handling, storage, or transfers, to include residue points and inert storage yards; for air defense; or as munitions operating facilities, the exceptions being facilities in which the processes used might have resulted in the generation of concentrations of munitions constituents high enough to present an explosive hazard. Areas on which a previous response has been completed, pursuant to a DDESB-approved ESS, for the stipulated reuse also qualify for “low” determinations.

C15.4.2.2.2. Moderate to High Probability. EOD personnel or UXO-qualified personnel must attempt to identify and remove any explosive or CA hazards in the construction footprint prior to any intrusive construction activities.

C15.4.2.2.2.1. A “moderate to high” determination may be assigned to those areas for which a search of available historical records or onsite investigation data indicates that, given the military or munitions-related activities that occurred at the site, there is more than a low probability that UXO or other MEC are present.

C15.4.2.2.2.2. Munitions-related activities that may merit a “moderate to high” determination include, but are not limited to, the use of the area: for live-fire training other than exclusively with small arms ammunition (e.g., munitions containing high explosive projectiles); as operational range impact areas; for OB or OD of excess, obsolete, or unserviceable munitions; as munitions operating facilities where processes used might have resulted in the generation of concentrations of munitions constituents high enough to present an explosive hazard; for munitions burial; or for any activities involving possible disposition of CWM.

C15.4.3. Anomaly Avoidance. Anomaly avoidance techniques must be employed on properties known or suspected to contain UXO or DMM to avoid surface UXO and, when necessary, subsurface anomalies.

C15.4.3.1. When anomaly avoidance is used during training (e.g., maneuver training, live-fire training), testing, or operational range management activities conducted on such properties, the commander responsible for such activities will ensure:

C15.4.3.1.1. A risk assessment to evaluate the potential hazards associated with the proposed activities is completed and methods to mitigate any potential exposures are implemented.



C15.4.3.1.2. Training in anomaly avoidance, explosives safety and, when appropriate, CA safety training is provided to all personnel involved in the training, testing, or operational range management activities that access property known or suspected to contain UXO or DMM.

C15.4.3.2. When anomaly avoidance is used during other than training or testing activities, or during activities involving other than operational range management activities:

C15.4.3.2.1. Surface UXO must be avoided during any activities that require entry to the area (e.g., conducting cultural resource studies).

C15.4.3.2.2. Surface UXO and subsurface anomalies must be avoided during any intrusive work (e.g., drilling environmental monitoring wells).

C15.4.3.2.3. Escort support must be provided by EOD personnel, or:

C15.4.3.2.3.1. Within areas known or suspected to contain UXO, excluding CA, regardless of configuration, by:

C15.4.3.2.3.1.1. UXO-qualified personnel.

C15.4.3.2.3.1.2. UXO Technician I personnel under the supervision of UXO-qualified personnel. The responsible commander or authority may, based on a risk assessment and implementation of methods to mitigate any potential exposures, approve UXO Technician I personnel to perform escort duties without supervision.

C15.4.3.2.3.2. Within areas known or suspected to contain CA, regardless of configuration, to include areas where such CA is commingled with other UXO, by UXO-qualified personnel trained in CWM responses.

C15.4.3.2.4. During anomaly avoidance:

C15.4.3.2.4.1. Discovered surface UXO must be avoided and their locations noted and reported to appropriate authorities.

C15.4.3.2.4.2. Detected subsurface anomalies which must not be investigated shall be marked, when appropriate, and avoided.

## C15.5. ACCESS TO AREAS KNOWN OR SUSPECTED TO CONTAIN UXO

To ensure explosives and CA safety risk is identified and controlled on real property currently or formerly under the jurisdiction, custody, or control of a DoD Component, DoD Components must:

C15.5.1. Prohibit unnecessary access (e.g., livestock grazing; recreational uses, such as hunting and hiking) and take appropriate action to deter unauthorized access to areas under DoD control that are known or suspected to contain UXO or other munitions that have experienced abnormal environments.

C15.5.1.1. Access to such areas, particularly operational range impact areas, shall be limited to personnel who have an operational requirement to enter such areas (e.g., range maintenance, environmental monitoring, security). A risk assessment to evaluate the potential hazards associated with the proposed activity shall be completed and methods to mitigate any potential exposures shall be implemented before allowing access.

C15.5.1.2. Actions to prohibit or deter access may include establishing access controls (e.g., fencing the area, establishing roving security patrols) and providing public notifications (e.g., posting UXO hazard warning signs, conducting UXO safety education programs) of any potential hazards. (When used, signs must be legible and, when appropriate, multi-lingual or pictograms.)

C15.5.2. When the Department of Defense does not control the area (e.g., FUDS), at a minimum, provide written notification to the property owner and, if known, any tenants of the potential explosive and CA hazards present. A record of this notification must be maintained in permanent records.

C15.5.3. Assume the following areas contain UXO or other munitions that have experienced abnormal environments:

C15.5.3.1. Operational range impact areas, to include their associated safety zones (e.g., caution area, safety buffer zone). Exceptions include, but are not limited to, ranges used exclusively for training with small arms ammunition.

C15.5.3.2. Ranges (sites) used for OB or OD of excess, obsolete, or unserviceable munitions.

C15.5.3.3. Former impact areas and former OB or OD sites, unless documentation exists to show that they were adequately cleared during range closure or that an appropriate munitions response has been completed. In some cases, because these former impact areas or former OB or OD sites may have transferred from DoD control, the Department of Defense's ability to restrict access may be limited or nonexistent. In such cases, the responsible DoD Component shall, at a minimum, ensure that:

C15.5.3.3.1. The property owner is provided written notification of the potential explosives and CA hazards and the risks inherent in any use of property that is inconsistent with those hazards.

C15.5.3.3.2. A public UXO safety education program is implemented, when appropriate.



C15.5.4. On DoD property, prohibit construction in areas known or suspected to contain UXO or DMM without required:

C15.5.4.1. Construction or UXO avoidance support. (See paragraphs C15.4.2. or C15.4.3.)

C15.5.4.2. Approved ESS, CSS, or site plan for munitions responses. (See Chapter 12.)

C15.5.5. Provide, or in the case of owners or tenants of non-DoD controlled property, offer explosives safety and, when appropriate, CA safety training to all individuals authorized access to DoD property known or suspected to contain UXO.

C15.5.6. Develop guidelines to determine when individuals, who for operational reasons (e.g., environmental monitoring), are authorized access to areas under DoD control that are known or suspected to contain UXO, must be escorted into the area in accordance with subparagraph C15.4.3.2.3.

C15.5.7. Establish UXO safety education programs to educate DoD personnel, their dependents, and private citizens that live near areas known or suspected to contain UXO about explosive hazards and, when appropriate, CA hazards associated with UXO, and with the risks associated with trespassing on operational ranges or with entering areas known or suspected to contain UXO.

C15.5.8. Prior to changing the use of a property known or suspected to contain UXO or munitions that have experienced abnormal environments to a use that is incompatible with their presence:

C15.5.8.1. For operational ranges, perform an appropriate range clearance, whether changing to a similar (e.g., converting an impact area to a hand grenade range) or dissimilar use (e.g., changing a range to a maneuver area).

C15.5.8.2. For areas on DoD property, other than operational ranges, perform an appropriate munitions response.

C15.5.8.3. For property not under DoD control, upon learning of a proposed change in use or pertinent munitions response action, offer to engage in munitions response activities only to the extent necessary to ensure planned response actions afford protectiveness from an explosives and CA safety perspective. The DoD engagement in such munitions response activities may be limited to explosives safety experts providing basic guidance and advice during applicable deliberations, decision making, and approval activities unless additional DoD services are arranged through contractual or reimbursement mechanisms between DoD Components and other responsible parties.

## C15.6. IDENTIFICATION AND CONTROL

To ensure explosives and CA safety risk is identified and controlled on real property currently or formerly under the jurisdiction, custody, or control of a DoD Component, DoD Components must create and maintain permanent records required by paragraph C12.2.2. When an operational range is closed or an installation is deactivated, the DoD Component concerned must designate the office to transfer these records to ensure their permanent retention.

#### C15.7. MSD FOR UXO

C15.7.1. The MSD for intentional detonations (see Chapter 9), which may be reduced if supported by a hazard assessment or when using approved engineering controls listed in EOD publications (for explosives or munitions emergency responses), Reference (j), or other DDESB-approved engineering controls (for munitions responses), is the greatest distance of:

C15.7.1.1. Blast overpressure, as computed by using the formula:  $D = 328W^{1/3}$   
[ $D=130.16Q^{1/3}$ ].

C15.7.1.2. The calculated MFD, as provided in Reference (~~pr~~).

C15.7.1.3. The appropriate downwind hazard distance for CA.

C15.7.2. The MSD for unintentional detonations (see Chapter 9), which may be reduced if supported by a hazard assessment or when approved engineering controls are employed, for:

C15.7.2.1. Nonessential Personnel. The greatest distance of:

C15.7.2.1.1. Blast overpressure, as computed by using the formula:  $D = 40W^{1/3}$   
[ $D=15.87Q^{1/3}$ ].

C15.7.2.1.2. The calculated MFD, as provided in Reference (~~pr~~). (NOTE: Lesser distances may be used if supported by a hazard assessment; however, in no case will the distance be less than the HFD as provided in Reference (~~pr~~); the exception is when approved engineering controls are used.)

C15.7.2.1.3. The appropriate downwind hazard distance for CA.

C15.7.2.2. TSD. The greatest distance of:

C15.7.2.2.1. Blast overpressure, as computed by the formula:  $D = 40W^{1/3}$   
[ $D=15.87Q^{1/3}$ ].

C15.7.2.2.2. The appropriate downwind hazard distance for CA.

#### C15.8. OTHER CONSIDERATIONS

C15.8.1. Transportation. All transportation must comply with the requirements of applicable federal, state, interstate, and local laws, and all implementing regulations relating to transportation of solid waste, hazardous substances, hazardous materials, and toxic substances.

C15.8.1.1. UXO. Before UXO that may pose an explosive or CA hazard may be transported or shipped over public transportation routes, EOD personnel must determine whether the UXO is safe for transport. (For material potentially presenting an explosive hazard, see subparagraph C16.3.3.2.) A determination that the UXO is safe for transport must be documented in the EOD incident report. A copy of the incident report must accompany the shipment.

C15.8.1.2. RCWM. Before RCWM may be transported or shipped, it must be assessed by the Army Material Assessment Review Board as safe for transport and packaged in an overpack container specifically designed and approved by the Army and by the DOT for the transport of RCWM (see subparagraph C12.5.9.6.). In addition, the specific notifications and concurrences required in 50 U.S.C. § 1512 (Reference (~~ae~~*ar*)) must be met.

C15.8.2. Firefighting Involving Areas Known or Suspected to Contain UXO or DMM. (See Chapter 8.)

C15.8.2.1. Advanced planning is essential for firefighting operations involving areas that are known or suspected to contain UXO or DMM or CA hazards. Coordination of such plans between firefighters and explosives safety personnel or EOD personnel and, when appropriate, CA safety professionals, is essential.

C15.8.2.2. Senior firefighting personnel should carefully assess whether to fight a fire involving areas that are known or suspected to contain explosive or CA hazards. Factors to consider include, but are not limited, to: the types of munitions that might be present; the safety of firefighting personnel and of the public; the potential loss of critical assets; and the duration and intensity of the fire.

C15.8.2.2.1. When the decision is made not to fight such fires, the area should be evacuated and remain so until it has cooled for at least 24 hours. (See paragraph C8.5.4.)

C15.8.2.2.2. When the decision is made to fight such fires, all firefighters involved in fighting the fire should be provided basic safety training for fighting fires involving military munitions.

### C15.8.3. Controlled Burns

C15.8.3.1. Burning vegetation to facilitate safe UXO clearance or removal operations is permitted, provided proper safeguards are in place to protect all personnel from unintentional detonations. These burns must be carefully planned and executed to manage explosives safety risks and environmental effects. During such burning operations, all personnel shall be at MFD

from the burning or burned area, based on the MGF, and shall remain out of the area until it has cooled for at least 24 hours.

C15.8.3.2. Controlled burns will not be performed on areas known or suspected to contain CWM.

C15.8.4. Technology

C15.8.4.1. Explosives safety is a paramount consideration when determining the most appropriate technologies to be used to detect, excavate, remove, and dispose of UXO and other munitions that present an explosive hazard.

C15.8.4.2. The use of remotely operated equipment (e.g., excavators, sifters, and shredders) or other standoff technologies (e.g., lasers) may offer the safest approach for excavating and destroying UXO and should be considered.

C15.8.4.3. Subparagraph C12.5.8.3.5. addresses mechanized UXO processing operations.